

Pending Claims

A detailed list of all claims under examination is below.

1. (original): A composition comprising:
 - a) a sulfonated polyurethane polymer comprising the reaction product of:
 - i) a polyisocyanate;
 - ii) a sulfonated polyol;
 - b) a second polymer formed from vinyl monomers; and
 - c) water;wherein the sulfonated polyurethane polymer comprises ethylenic groups; and the composition has a VOC of less than about 5 % based on the total weight of the composition.
2. (original): The composition of claim 1, wherein the polyurethane polymer further comprises a sulfonated polyol without ethylenic groups.
3. (original): The composition of claim 1, wherein the polyurethane polymer further comprises a sulfonated polyol with ethylenic groups.
4. (previously presented): The composition of claim 1, wherein the sulfonated polyol comprises an aliphatic or aromatic diacid having at least one sulfonate group.
5. (previously presented): The composition of claim 4, wherein the sulfonated diacid comprises from about 3 to about 10 weight percent based on the weight of the polyurethane polymer.
6. (original): The composition of claim 5, wherein the sulfonated diacid comprises from about 4 to about 8 weight percent based on the weight of the polyurethane polymer.

7. (original): The composition of claim 6, wherein the sulfonated diacid comprises from about 5.5 to about 7.5 weight percent based on the weight of the polyurethane polymer.
8. (previously presented): The composition of claim 1, wherein the second polymer comprises vinyl monomers selected from the group consisting of acrylic acid, methacrylic acid, methyl acrylate, ethyl acrylate, propyl acrylate, butyl acrylate, 2-ethylhexyl acrylate, methyl methacrylate, ethyl methacrylate, propyl methacrylate, butyl methacrylate, 2-ethylhexyl methacrylate, hydroxyethyl acrylate, hydroxyethyl methacrylate, 2-(acetoacetoxy)ethylmethacrylate, acrylamide, methylacrylamide, diacetone acrylamide, styrene, α -methyl styrene, vinyl toluene, vinyl acetate, vinyl propionate, and mixtures thereof.
9. (previously presented): The composition of claim 8, wherein the second polymer comprises vinyl monomers selected from the group consisting of acrylic acid, methacrylic acid, methyl acrylate, ethyl acrylate, propyl acrylate, butyl acrylate, 2-ethylhexyl acrylate, methyl methacrylate, ethyl methacrylate, propyl methacrylate, butyl methacrylate, 2-ethylhexyl methacrylate, hydroxyethyl acrylate, hydroxyethyl methacrylate, acrylamide, methylacrylamide, styrene, α -methyl styrene, vinyl toluene, vinyl acetate, vinyl propionate, and mixtures thereof.
10. (original): The composition of claim 9, wherein the second polymer comprises methyl methacrylate, butyl acrylate, styrene, vinyl acetate, or a mixture thereof.
11. (previously presented): The composition of claim 8, wherein the second polymer is a poly(meth)acrylate polymer.
12. (original): The composition of claim 11, wherein, the poly(meth)acrylate polymer comprises a copolymer of an acrylate ester, methacrylate ester, acrylamide, methacrylamide, acrylic acid, methacrylic acid, or a mixture thereof.

13. (original): The composition of claim 12, wherein the poly(meth)acrylate polymer comprises vinyl monomers selected from the group consisting of comprising methyl acrylate, ethyl acrylate, butyl acrylate, 2-ethylhexyl acrylate, methyl methacrylate, ethyl methacrylate, butyl methacrylate, and mixtures thereof.
14. (previously presented): The composition of claim 13, wherein the poly(meth)acrylate polymer comprises methyl methacrylate, butyl acrylate, or a mixture thereof.
15. (original): The composition of claim 14, wherein the second polymer further comprises styrene, vinyl acetate, or a mixture thereof.
16. (previously presented): The composition of claim 1, wherein the second polymer is polymerized using a free radical catalyst.
17. (previously presented): The composition of claim 1, wherein the polyisocyanate is 1,2-ethylene diisocyanate, 1,4-tetramethylene diisocyanate, 1,6-hexamethylene diisocyanate, 2,2,4-trimethyl-1,6-hexamethylene diisocyanate, 2,4,4-trimethyl-1,6-hexamethylene diisocyanate, 1,12-dodecane diisocyanate, cyclobutane 1,3-diisocyanate, cyclohexane 1,3-diisocyanate, cyclohexane-1,4-diisocyanate, bis(4-isocyanatocyclohexyl)methane, 1-methylcyclohexane-2,2-diisocyanate, 1-methylcyclohexane-2,6-diisocyanate, 3-isocyanatomethyl-3,5,5-trimethyl-cyclohexyl isocyanate, 2,5-bis(isocyanatomethyl)-8-methyl-1,4,-methano-decahydronaphthalene, 3,5-bis(isocyanatomethyl)-8-methyl-1,4,-methano-decahydronaphthalene, 2,6-bis-(isocyanato)-4,7-methano-hexahydroindane, dicyclohexyl 2,4'-diisocyanate, dicyclohexyl 4,4'-diisocyanate, 2,6-hexahydrotolulene diisocyanate, 2,6-hexahydrotolulene diisocyanate, perhydro-2,4'-diphenylmethane diisocyanate, perhydro-4,4'-diphenylmethane diisocyanate, 1,3-phenylene diisocyanate, 1,4-phenylene diisocyanate, 4,4'-biphenyl diisocyanate, 4,4'-diisocyanato-3,3'-dimethoxybiphenyl, 4,4'-diisocyanato-3,3'-dimethylbiphenyl, 3,3'-diphenylbiphenyl-4,4'-

diisocyanate, 2,4'-diphenylmethane diisocyanate, 4,4'-diphenylmethane diisocyanate, naphthylene 1,5-diisocyanate, 2,4- toluene diisocyanate, 2,6- toluene diisocyanate, N,N'-(4,4'-dimethyl-3,3'-diisocyanato-diphenyl)uretdione, m-xylylene diisocyanate, tetramethylxylene diisocyanate, 2,4,4'-triisocyanatodiphenyl ether, 4,4',4''-triisocyanatotriphenylmethane, tris (4-isocyanatophenyl) thiophosphate, or a mixture thereof.

18. (original): The composition of claim 17, wherein the polyisocyanate is a diisocyanate.
19. (original): The composition of claim 18, wherein the diisocyanate is 2,4- toluene diisocyanate, 2,6- toluene diisocyanate, 1,6-hexamethylene diisocyanate, 2,4'-disocyanato-diphenylmethane, 4,4'-disocyanato-diphenylmethane, 4,4'-diphenylmethane diisocyanate, 3-isocyanatomethyl-3,5,5-trimethyl-cyclohexyl isocyanate, bis(4-isocyanato-cyclohexyl)methane, dicyclohexyl 2,4'-diisocyanate, dicyclohexyl 4,4'-diisocyanate, or a mixture thereof.
20. (previously presented): The composition of claim 1, wherein the sulfonated polyol comprises a polyester, an alkyd or a mixture thereof.
21. (previously presented): The composition of claim 4, wherein the sulfonate groups are present in the form of ammonium, tertiary amine, calcium, copper, or iron salts.
22. (previously presented): The composition of claim 4, wherein the sulfonate groups are present in the form of alkali metal salts.
23. (original): The composition of claim 22, wherein the alkali metal salts are lithium, sodium or potassium.
24. (previously presented): The composition of claim 1, wherein the sulfonated polymer comprises a derivative of 5-sulfo-isophthalic acid.

25. (previously presented): The composition of claim 1, wherein the polyurethane polymer further comprises a chain extension agent.
26. (original): The composition of claim 25, wherein the chain extension agent is an alkyl amino alcohol, cycloalkyl amino alcohol, heterocyclic amino alcohol, polyamine, hydrazine, substituted hydrazine, hydrazide, amide, water or a mixture thereof.
27. (original): The composition of claim 25 wherein the chain extension agent comprises ethylene diamine, diethylene triamine, triethylene tetra amine, melamine or a mixture thereof.
28. (original): The composition of claim 25, wherein the chain extension agent comprises ethylene diamine.
29. (original): The composition of claim 25, wherein the chain extension agent comprises polyalkene oxide, a hydroxyl functional latex or amine functional latex.
30. (previously presented): The composition of claim 1, wherein the composition has a VOC less than about 3 percent, based on the total weight of the composition.
31. (original): The composition of claim 30, wherein the VOC is less than about 1 percent, based on the total weight of the composition.
32. (original): The composition of claim 31, wherein the VOC is substantially zero percent, based on the total weight of the composition.
33. (previously presented): A process for preparing a water dispersible polyurethane - polyethylene polymer composition of claim 1 comprising;
 - a) blending a polyurethane prepolymer with one or more vinyl monomers, inert to isocyanate functionality;
 - b) dispersing the prepolymer/vinyl monomer blend into water;

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- c) chain extending the terminal isocyanate groups of the prepolymer with one or more active hydrogen containing compounds wherein the chain extended polyurethane prepolymer has
 - i) at least one sulfonate group and at least one curable ethylenic unsaturated group; and
 - ii) terminal isocyanate groups or both terminal isocyanate groups and terminal vinyl groups; and
- d) reacting the vinyl monomers by free radical polymerization.